The National Space Grant Office requires two annual reports, the Annual Performance Data Report (APD – this document) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.

Washington Space Grant Consortium

University of Washington
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Telephone Number: 206-543-1943
Consortium URL: http://www.waspacegrant.org
Grant Number: NNX10AK64H

PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Washington Space Grant Consortium is a Designated Consortium funded at a level of $575,000 for fiscal year 2014.

PROGRAM GOALS

The overall objective of Washington NASA Space Grant Consortium (WSGC) is to provide high quality programs that align with the NASA Office of Education Outcomes and serve the needs of our state. WSGC seeks to enhance higher education opportunities for students seeking to pursue careers in the fields of science, technology, engineering and math (STEM); to enrich and improve STEM education at Washington's diverse pre-college, college, university and community learning centers; and to provide public outreach for NASA missions, and thereby strengthen the future workforce for NASA and our nation. To that end, our SMART goals and metrics are as follows:

OUTCOME 1

SMART Goal #1: *Diversity - To attract and retain high-achieving students underrepresented in the sciences and engineering into higher education institutions*

statewide, to space-related degree programs and career tracks supporting NASA's missions.

Metric 1.1: Award WSGC scholarships and research internships to underrepresented minority students at or above 17%; enroll underrepresented minority students in higher education courses at or above the percentage of their undergraduate enrollment in the UW College of Engineering for the year.

Metric 1.2: Award WSGC scholarships and research internships to women undergraduates at or above 40%; enroll women in higher education courses at or above the percentage of their undergraduate enrollment in the UW College of Engineering for the year.

Metric 1.3: Foster strong programs at our minority serving institutions including partnerships with other affiliates so they may tap into the state's research colleges while developing more opportunities for their students to participate in hands-on research.

SMART Goal #2: *Scholarships & Fellowships* **-** *To attract and retain high-achieving students statewide, especially those underrepresented in the sciences and engineering, to space-related degree programs and career tracks supporting NASA's missions.*

Metric 1.4: Continue WSGC's undergraduate scholarship program through its academic affiliates and partners to provide 60 scholarships to undergraduate students statewide.

Metric 1.5: Continue WSGC's graduate fellowship program at the state's two primary research universities (UW and WSU) with a minimum of 12 fellowships per year.

Metric 1.6: Enhance support for students in community colleges and/or community college students with associate degrees transferring to four-year colleges, awarding 10 scholarships annually.

Metric 1.7: Achieve 95% retention in STEM disciplines of all scholarship awardees.

Metric 1.8: Establish regular communication with WSGC scholarship and fellowship alumni from all consortium institutions through our longitudinal tracking system and social networking sites. Target: 65% alumni tracked by the end of FY2014.

SMART Goal #3: *Research Infrastructure - To expand participation in existing WSGC-sponsored undergraduate research and NASA internships; to increase collaborative efforts of university scientists and students with industry leaders in aerospace-related programs by establishing summer industry intern programs among all members of the consortium; to support the expansion of research opportunities for graduate and undergraduate students to work with STEM-field faculty across the state of Washington, particularly women and underrepresented minority students and faculty, as well as early career faculty; and to support teams in NASA-sponsored and/or aerospace activities and competitions.*

Metric 1.9: Continue to support an active WSGC-sponsored undergraduate research program within our higher education affiliates, with 60 undergraduate researchers.

Metric 1.10: Continue support of our summer industry internship program with local companies involved in STEM research and expand the program when opportunities arise, with a target of four internships.

Metric 1.11: Foster closer ties with our private sector partners through participation in at least one research symposium.

Metric 1.12: Continue support of a summer NASA internship program and ensure access to students by providing partial funding for six NASA interns**.**

SMART Goal #4: *Higher Education - Provide NASA competency-building education and research opportunities for faculty, researchers, and post-doctoral fellows; develop and expand participation in NASA-related courses for integration into STEM disciplines; provide NASA competency-building education and research opportunities to individuals to develop qualified undergraduate and graduate students who are prepared for employment in STEM disciplines at NASA, industry, and higher education.*

Metric 1.13: Support the integration of NASA-related research and education at the undergraduate and graduate levels through three or more courses that focus on results from NASA missions or provide experiential learning opportunities in aerospace. [Target: Support a total of 3 courses, reaching 350 students.]

Metric 1.14: Augment the opportunities for students at minority serving institutions and community colleges to participate in opportunities at our state's larger colleges including hands-on courses/research internships and the NWIC rocket program. [Target: 4 MSI/CC students in hands-on research annually].

OUTCOME 2

SMART Goal #5: *To enhance teaching of STEM topics at a K-12 level and attract students to these fields through engaging informal and formal education programs based on NASA themes and materials; to provide courses and workshops to improve teachers' mastery of STEM disciplines and through those projects help Washington students (especially those from underserved communities) meet state and national standards; to provide hands-on research experiences for pre-service teachers in STEM fields.*

Metric 2.1: Support 21 technical or professional development workshops for in-service teachers, with at least one workshop in a rural area serving a traditionally underserved population.

Metric 2.2: Provide research experiences for a minimum of seven pre-service teachers in STEM fields each year.

Metric 2.3: Collaborate with the Washington Aerospace Scholars (WAS) program to expand opportunities for high school juniors with STEM career interests and enhance program capacity by supporting the training of 16 in-service teachers/mentors to remain with WAS year-round.

Metric 2.4: Support teacher participation in national conferences focused on NASA science mission results or participation in NASA-sponsored science competitions, with a target of two opportunities for in-service teachers and/or K-12 teacher-student teams.

Metric 2.5: Produce an electronic newsletter twice monthly during the school year to connect educators, informal and formal, with relevant NASA-related materials, curriculum ideas, Internet links and other STEM resources.

OUTCOME 3

SMART Goal #6: *To share the excitement and knowledge gained from NASA's missions with the general public; to strengthen collaborative efforts within the consortium as well as with industry, community, and governmental organizations to support NASA and WSGC goals and activities; to provide informal education support resources that use NASA themes and content to enhance participant skills and proficiency in STEM disciplines and inform participants about STEM career opportunities; and to support Washington's museums and science centers in their efforts to engage the public in major NASA events*.

Metric 3.1: Utilize print and electronic publications to generate excitement about NASA's missions, publicize scholarships, fellowships and research opportunities, and foster collaboration among consortium institutions.

Metric 3.2: Work with informal organizations such as museums to provide at least one relevant science activity each year at a major event or exhibit.

Metric 3.3: Provide materials for museum and public events that showcase NASA missions at least once a year and regularly publicize NASA-related programs at WSGC museum affiliates via our newsblog, educator e-letter and mailing lists to students. Provide materials for at least one new informal education event.

Metric 3.4: Work more closely with consortium members to assure coherence in WSGC programs, to share expertise and resources, and to bring together students and faculty from all institutions to present their research. [Target: One face-to-face meeting annually.]

PROGRAM/PROJECT BENEFIT TO OUTCOME (1,2, & 3)

WSGC's FY2014 projects are chosen to create an educational pipeline to engage, educate and ultimately employ Washington residents in science, technology, engineering and math (STEM) fields. In Outcome 1, for example, Whitworth University student Sarah Gady, an engineering physics major, leveraged the skills that she gained in a previous WSGC research experience on her campus to secure a summer internship at NASA Glenn Research Center modeling the cerebral fluid response of astronauts in microgravity and its effects on astronaut vision.

In Outcome 2, WSGC launched a professional development program in rocketry for middle and high school teachers on tribal lands. The curriculum draws on hands-on activities featured in NASA materials and in the higher education course, Space and Space Travel, which was developed by WSGC and adopted by Washington Aerospace Scholars as a distance-learning course for college credit. Our first teacher will launch for certification in April and then be able to mentor both his students and fellow teachers.

In Outcome 3, WSGC aided Pacific Science Center in implementing its NASA Now grant to engage underrepresented high school students through an out-of-school program and to develop four new live planetarium shows showcasing NASA missions and data for delivery on- and off-site to schoolchildren and the general public. In addition to providing financial support, the WSGC director and one associate director serve on the project's advisory committee. As a measure of our success, this support translated into an additional 98 public planetarium shows in FY2014, reaching 2,600 more visitors.

PROGRAM ACCOMPLISHMENTS

In Outcome 1, WSGC met all three of our Outcome 1 diversity metrics (1.1, 1.2 and 1.3). We exceeded our targets for awarding scholarships, fellowships, and undergraduate research awards on-campus and at NASA centers, directly supporting students from nine of our 10 academic affiliates (1.4, 1.5, 1.6, 1.9, 1.12, 1.14, plus 2.2). Student work was presented during our annual poster session and reception (1.11 and 3.4). Fields of study included astronomy, chemistry, physics, Earth and space sciences, environmental science, and engineering disciplines, including aeronautics and astronautics, electrical and mechanical. We also supported three courses focused on results from NASA missions or hands-on learning (1.13). We did not meet our goal for private industry internships, placing only two students for summer FY2014; however, we received internship commitments from three of our industry partners in February and will be back on target in 2015 (1.10). Longitudinal tracking shows 90% of our alumni who took their next step in FY2014 remained in STEM (1.7, 1.8). Survey responses from graduates of our two-year schools have lagged those of other awardees, and this may be the reason for the drop in our retention rate. We plan to address this issue through stronger outreach in FY2015.

In Outcomes 2 and 3, WSGC supported 24 short-duration professional workshops in underserved rural communities with high poverty and large Hispanic and/or Native American populations, reaching 349 K-12 teachers (2.1). WSGC continued collaborating with Washington Aerospace Scholars (WAS), providing state-certified mentors, UW distance learning credit, and on-campus experiences for high school juniors (2.3). We also supported the establishment of a K-12 rocketry program on tribal lands and an additional science café workshop for teachers (2.4). We met our goals for producing our electronic newsletter for teachers, and for utilizing print and electronic publications to publicize NASA-related opportunities and programs (2.5, 3.1, 3.3). In addition to funding for the PSC planetarium shows mentioned earlier, WSGC supported PSC outreach vans participating in events at 18 schools and the Kids' Fest Family Fair at the Joint Base Lewis-McChord, providing access to exhibits, lessons and hands-on activities for approximately 6,800 children and nearly 600 adults (3.3).

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- **Diversity:** WSGC supports diversity of institutions through the membership and partnership of 4 minority serving institutions (HU, NWIC, SCC and NSC) and 4 community colleges (ECC, EvCC, SCC and NSC) and through faculty and WSGC representatives = 19 female and 4 underrepresented minorities. To date, WSGC also supported diversity by meeting its specific metrics for participation by women and underrepresented minorities in scholarships and fellowships, research and higher education programs = 98 total female participants (90 significant awards) and 49 underrepresented minority participants (43 significant awards). (Objectives 1.1, 1.2, 1.3 and 1.14).

- **Minority-Serving Institution Collaborations:** For FY2014, WSGC's tribal college affiliate, Northwest Indian College, received $20,000 NASA funding and provided matching funds of $5,000 for student programs. The NASA funds are utilized in the support of the NWIC competitive rocket team and a physics class aligned with the team's efforts. To date, NWIC reported 14 direct team participants, all underrepresented minority students. All but two participants were pursuing Bachelor of Science degrees in Native Environmental Science or STEM-related associate degrees (the others are completing Bachelor of Arts degrees in Tribal Governance and Business Management). WSGC support includes travel funding for the team to compete in the NASA USLI launch competition April 7-12, 2015, and the First Nations Launch competition April 30 – May 2, 2015. Last year, the team dominated the First Nations Launch, taking first place in the Tribal Climate Change Challenge and in the Supersonic Challenge, breaking the sound barrier at 767 mph. In addition, WSGC provided airfare and partial funding for one NWIC student to participate in a second NASA Academy summer internship at NASA Goddard Space Flight Center. Students from the previous NWIC Rocket Team and the NASA Academy intern (also a rocket team member) presented the results of their research at the 2014 Space Grant Awards Reception and Poster Session. Seattle Central College, an Asian American and Native American Pacific Islander-Serving Institution (AANAPISI) and community college, received $10,000 NASA funding and provided $10,000 matching funds for scholarships. In FY2014, SCC reported 14 direct awards (ten to underrepresented students). In addition, NWIC, SCC and North Seattle College, another AANAPISI community college, collaborated along with three other WSGC schools on a successful NASA grant to strengthen STEM education at the state's two-year institutions. Heritage University, a Hispanic-Serving Institution, received $5,000 in NASA funding to support two informal education programs aimed at strengthening the STEM pipeline for underrepresented students. These programs are the First Nations MESA (Mathematics Engineering Science Achievement) Center and the local NSF-sponsored EnvironMentors Program, both of which provide STEM-focused, out-of-school learning programs for middle and high school students from the Yakama Nation reservation lands and surrounding area.

- **NASA Education Priorities:** In FY2014, WSGC accomplishments relate to the following "Current Areas of Emphasis" stated in the 2010 Space Grant solicitation:
  - Authentic, hands-on student experiences in science and engineering disciplines — experiences rooted in NASA-related, STEM issues — were supported through student research programs on member campuses, at NASA centers and in private industry = 104 awards to 82 students (students may have participated in more than one program in FY2014); development and support of 1 undergraduate course = 194 students (Objectives 1.9, 1.10, 1.11, 1.12, 1.13 and 1.14). These were also supported through teacher professional development = 349 in-service teachers and the PSC Discovery Corps and WAS program = 151 high school students (Objectives 2.1, 2.3, 2.4 and 3.2).
  - WSGC engaged middle school teachers in hands-on curriculum enhancement capabilities through short- and long-duration workshops provided by NCESD

= 13 workshops/99 in-service teachers; research experiences for pre-service teachers = 7 pre-service teachers (Objectives 2.1, 2.2).

- Providing summer opportunities for secondary students on college campuses was accomplished through our participation in the WAS program's summer residency, which targets high school juniors = 157 students (Objective 2.3).
- Community College relationships were created and strengthened through research experiences on campus and in private industry = 2 students (Objectives 1.11, 1.14).
- Aeronautics research was supported through scholarships and fellowships = 6 students; internships on campus, in private industry and at NASA Centers = 11 students (Objectives 1.4, 1.5, 1.6, 1.9, 1.10, 1.12, and 1.14).
- Research in environmental science and global climate change is supported through fellowships, scholarships and internships = 38 students (Objectives 1.4, 1.5, 1.6, 1.9, 1.12, 1.13, and 1.14).

IMPROVEMENTS MADE IN THE PAST YEAR

WSGC continues to seek new ways to encourage collaboration among its members and partners, and to strengthen the state's K-12 pipeline, especially in underserved communities. In FY2014, four WSGC members (UW, CWU, NWIC, and SCC) and three partners (ECC, EvCC and NSC) collaborated on a successful proposal in response to NASA's Competitive Opportunity for Partnerships with Community Colleges and Technical Schools. The proposal was designed to leverage the success of previous WSGC projects (internships, course development, etc.) and strengthen ties between our two- and four-year affiliates. For instance, a planned course repository will provide an opportunity for non-affiliated schools around the state to gain access to the UW Space and Space Travel curriculum, developed with WSGC support and currently being used as a distance learning option, allowing high school juniors in WAS a chance to earn transferable college credit at a reduced cost. Access to our curriculum may serve as a pipeline to bring in additional community colleges as partners.

In FY2014, we also returned to the management structure of a director and two associate directors. The current student programs coordinator was promoted to associate director. WSGC leadership is also working with Andrews Space, Aerojet Rocketdyne, Tethers Unlimited and Eagle Harbor Technologies to help establish a UW CubeSat program. A revised proposal on this effort was resubmitted to the state's Joint Center for Aerospace Technology Innovation (JCATI). A student group has been formed to undertake the preliminary design for the CubeSat.

At the precollege and informal education levels, we continued to emphasize a multi-pronged approach toward increasing diversity throughout the educational pipeline. North Central Educational Service District (NCESD) continues to play a key role in this strategy. The district serves 29 school districts; 46% of its students identify as underrepresented minorities and more than 60% receive free or reduced lunches. In FY2014, NCESD focused its WSGC-support on professional development workshops to give its teachers the tools and confidence to more smoothly transition to the New

Generation Science Standards. Based on the success of our NCESD collaboration, this spring we supported our first professional development event with the Olympic Educational Service District (OESD), which serves the Olympic and Kitsap Peninsulas. Kareen Borders, the district's new director of professional learning and assessment, is the former head of Key Peninsula Middle School's NASA Explorer School team and has received WSGC support in the past for several NASA education and research projects. We anticipate recognizing OESD as a full partner in the future. In addition, UW is collaborating with the Confederated Tribes of the Colville Reservation and the Confederated Tribes and Bands of the Yakama Nation to establish an out-of-school rocketry program utilizing NASA curriculum materials and Estes and Level 1 rockets. The goal is to provide experiential learning opportunities for underrepresented middle and high school students to acquire knowledge, understand what they have learned, and apply that knowledge through inquiry-based and project-based activities.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

WSGC is comprised of 14 member institutions and seven industry and educational partners, which are described below:

Higher Education

- *University of Washington*, the lead institution, is a major research university, receiving $1.38 billion in research grants and contracts in FY2014.
- *Central Washington University,* a centrally-located, public four-year university, with 20% of its incoming classes identifying as students of color (largely Hispanic/Latino).
- *Heritage University*, a Hispanic-serving institution (HSI) located within the Yakama Nation reservation in central Washington.
- *Northwest Indian College* (NWIC), a tribal college in northern Washington.
- *Seattle Central College* (SCC), an urban AANAPISI community college with high minority enrollment.
- *Seattle University*, the largest independent university in the Pacific Northwest.
- *University of Puget Sound*, a four-year liberal arts college located in Tacoma.
- *Washington State University* (WSU), a major research university and the state's land grant university.
- *Western Washington University*, home to the Science, Mathematics, and Technology Education (SMATE) program for pre-service teachers and education research.
- *Whitman College,* a private liberal arts school located in central Washington.
- *Whitworth University,* a private liberal arts school located in eastern Washington.

K-12

- *North Central Educational Service District* (NCESD), the state's largest ESD, serving a mostly rural, economically disadvantaged, Hispanic and Native American population.

Informal Education

- *Museum of Flight* (MoF), a provider of informal education and training for pre-college students and in-service teachers, as well as home to Washington Aerospace Scholars.
- *Pacific Science Center* (PSC), a provider of informal education and training for pre-college students and in-service teachers.

WSGC industry partners within the field of aeronautics and astronautics are Aerojet Rocketdyne, Eagle Harbor Technologies, and Tethers Unlimited, Inc.; partner Woodruff Scientific, Inc. is focused on new energy technologies. Educational partners are North Seattle College (NSC), an AANAPISI, two-year college serving north Seattle and the neighboring suburbs; Edmonds Community College (ECC), a two-year college that participates through its collaboration with Central Washington University; and Everett Community College (EvCC), a two-year college with strong ties to the state's aerospace and manufacturing companies.